1921

FARMERS' BULLETIN - 1205
UNITED STATES DEPARTMENT OF AGRICULTURE

POTATO PRODUCTION *in the* SOUTH

IMPERIAL BUREAU OF MYCOLOGY
11 JUL 1921

THE IMPORTANCE of the potato crop in the South is due to its market value rather than its magnitude, for owing to the season of the year in which it is harvested it usually commands a better price per bushel than the late crop in the North.

The wide divergence of seasonal conditions in the South, coupled with a long growing season, makes it possible to plant and harvest potatoes in some locality in practically every month of the year.

Owing to varying climatic conditions, due to both altitude and latitude, there are three distinct potato-crop seasons in the Southern States. These are the early or truck crop, the late or main crop, and the fall crop, which last may be divided into a second crop and a fall crop proper.

The early or truck crop is largely confined to well-defined production centers.

Because practically all the early crop is marketed direct from the field when it is in a more or less immature condition, the question of packages and of shipping facilities is important.

The leading varieties used for early-crop production are the Irish Cobbler, Triumph, and Spaulding No. 4; those for the late or main crop, the Green Mountain, Gold Coin, Rural New Yorker No. 2, Carman No. 3, Sir Walter Raleigh, White Star, and Early Ohio; and for a fall crop, usually for table use, the McCormick, White McCormick, Jersey Red, Green Mountain, Rural New Yorker No. 2, Russet Rural, White Star, and Peerless.

Contribution from the Bureau of Plant Industry

WM. A. TAYLOR, Chief

Washington, D. C. June, 1921

Show this bulletin to a neighbor. Additional copies may be obtained free from the Division of Publications, United States Department of Agriculture.

POTATO PRODUCTION IN THE SOUTH.

WILLIAM STUART, *Horticulturist, Office of Horticultural and Pomological Investigations.*

CONTENTS.

	Page.		Page.
Comparative cultural practices	3	The late or main crop	26
Extent and importance of the potato crop	3	The fall crops	29
Potato production in the Southern States	4	Marketing the fall crops	37
Seasonal crop divisions	5	Storage	37
The early or truck crop	5	Summary	38

COMPARATIVE CULTURAL PRACTICES.

THE CULTURAL OPERATIONS involved in the production of potatoes in the South and the marketing of the crop of the region are in many respects radically different from those of the North. The chief points of difference are the use of northern-grown instead of locally grown seed; the growing of a very early and a very late crop; the production of a second crop; radically different practices in the preparation of the land, in the application of commercial fertilizers, and in the cultivation and harvesting of the crop; different containers for marketing the crop; and the general practice of disposing of the entire crop as harvested.

EXTENT AND IMPORTANCE OF THE POTATO CROP.

The extent of any given crop, either in acreage or bushels, is not necessarily a true criterion of its agricultural importance. A comparison of the total production serves by contrast to emphasize the great commercial importance of the potato crop in the northern region as compared with that of the far West or the South. The accompanying figures represent the average production for the 5-year period, 1915 to 1919, inclusive.

Southern States (listed in Table I), 64,708,200 bushels, or 17.24 per cent of the total.

Far Western States (New Mexico, Colorado, Wyoming, Montana, and States west to the Pacific), 56,828,000, or 15.14 per cent of the total.

Northern States (remaining States), 253,820,000 bushels, or 67.62 per cent of the total.

It is evident from these data that the southern crop, when viewed quantitatively, is not of great comparative importance as a source of food; but the larger part of the southern crop is marketed at a season of the year when the consuming public is eager for fresh

vegetables and is willing to pay a premium for them. For this reason, the early-crop potatoes from the South sell at a much higher price as a rule than the old potatoes competing with them in the market. The total value of the southern crop, therefore, is much greater than its bulk would indicate.

POTATO PRODUCTION IN THE SOUTHERN STATES.

Table I shows the annual production and value of the potato crop of the South by States for the 6-year period from 1914 to 1919, inclusive. The reason for presenting the figures for each year rather than the average annual production of these several States is to bring out the marked increase in production in 1917, following the short crop and consequent high prices which prevailed for late potatoes in the autumn and winter of 1916 and the spring of 1917.

The State of Virginia shows the greatest increase. The production of potatoes in Virginia in 1914 was 7,280,000 bushels, but in 1917 it was estimated at 19,800,000 bushels, an increase of approximately 172 per cent. Other States show a larger percentage of increase, but not so great an aggregate quantity.

This emphasizes one of the great potential possibilities of the southern potato-production territory in connection with the food supply of the Nation. When there is a definite shortage of potatoes at the close of the storage season in the North in any particular year, it is perfectly feasible, as was demonstrated in 1917, to increase the acreage of the southern crop to such an extent as to make good in large measure any reasonable shortage in the total production which may be required.

TABLE I.—*Total production and farm value of potatoes in bulk in the Southern States on December 1 of each year for the 6-year period from 1914 to 1919, inclusive.*

[The quantitative data shown represent thousands of bushels and the values thousands of dollars.]

State.	1914		1915		1916		1917		1918		1919	
	Bushels.	Value.	Bushels.	Value.	Bushels.	Value.	Bushels.	Value.	Bushels.	Value.	Bushels.	Value.
Alabama	1,422	$1,436	1,600	$1,440	1,800	$3,042	2,952	$5,373	4,800	$8,688	3,520	$7,568
Arkansas	1,500	1,455	2,520	1,915	1,625	3,088	2,400	3,768	2,400	4,416	3,321	6,808
Delaware	880	616	1,045	784	900	1,125	1,235	1,606	957	1,340	913	1,141
Florida	1,040	1,175	960	1,104	1,110	2,220	2,275	4,664	3,500	7,000	1,824	3,830
Georgia	780	819	1,040	1,030	900	1,575	1,596	3,112	1,610	2,978	1,610	3,494
Kentucky	2,250	1,890	6,426	3,534	4,116	5,845	6,720	9,408	5,625	9,281	5,040	10,584
Louisiana	1,680	1,630	1,428	1,357	1,625	2,714	1,600	2,944	4,345	6,518	1,600	3,520
Maryland	3,432	2,059	4,268	2,646	4,085	5,433	6,000	7,140	4,000	4,800	5,170	6,721
Mississippi	960	912	1,170	983	780	1,248	1,092	1,835	1,600	2,640	1,530	2,830
North Carolina	1,716	1,579	3,150	2,300	3,230	4,522	4,500	6,435	4,275	5,771	4,930	8,036
Oklahoma	2,240	2,016	2,975	2,499	1,802	3,514	2,484	4,471	1,258	2,453	3,520	7,216
South Carolina	770	962	880	1,012	750	1,312	1,440	3,024	2,856	5,512	2,295	4,590
Tennessee	1,505	1,370	3,168	1,996	2,952	4,398	4,888	6,159	3,500	5,775	3,120	5,366
Texas	2,684	2,791	2,730	2,866	2,000	3,800	2,760	5,796	3,300	6,600	3,796	7,972
Virginia	7,280	5,606	17,500	16,675	16,250	22,262	19,800	24,750	11,750	14,100	11,495	18,047
West Virginia	2,592	2,100	5,850	3,802	4,224	6,674	7,475	9,867	5,220	8,352	5,130	8,978
Total	32,731	37,416	56,710	39,943	48,049	72,772	69,217	100,352	60,996	96,224	58,814	106,701

SEASONAL CROP DIVISIONS.

Potato production in the South has been discussed heretofore chiefly with reference to the early or truck crop. This has followed from the fact that in most of the Southern States the early crop is of greatest commercial importance. In this bulletin it is proposed to consider potato production under the three seasonal divisions: (1) The early or truck crop, (2) the late or main crop, and (3) the fall crops.

THE EARLY OR TRUCK CROP.

The best available data upon the early crop are those published in the May, 1918, issue of the Monthly Report of the Bureau of Crop Estimates, in which the disposal of the crop is given by months. The figures presented in Table II are based on this report. Percentages were obtained by assuming that the early crop was all marketed before August 31, and that the remainder of the potato crop represented either the main crop or the fall crop. While the time division is necessarily an arbitrary one, it is believed that it embraces the normal marketing period of the early crop. The statistics show, as might be expected, that the States of the extreme South produce a much larger percentage of early than of late potatoes, while those on the northern edge of the southern region produce a smaller percentage.

TABLE II.—*Early potatoes produced in the Southern States and marketed during the season of 1917.*

[The marketing season in the different States is assumed to begin with the month mentioned and to end on August 31.]

State.	Marketing begun—	Percentage of entire crop.	State.	Marketing begun—	Percentage of entire crop.
Alabama	April	86	Mississippi	April	85
Arkansas	May	53	North Carolina	May	48
Delaware	June	31	Oklahoma	do	71
Florida	February	93	South Carolina	April	86
Georgia	May	63	Tennessee	May	35
Kentucky	June	20	Texas	April	78
Louisiana	April	91	Virginia	May	43
Maryland	June	27	West Virginia	June	19

Early or truck crop production is very largely confined to certain definite areas, such as the Hastings district in Florida; the Savannah district in Georgia; the Beaufort and Charleston districts in South Carolina; Beaufort County, N. C.; the Norfolk district and the Eastern Shore of Virginia; the Eastern Shore of Maryland; the districts centering around Louisville, Ky., Columbia, Tenn., Fort Gibson, Okla., and Fort Smith, Ark.; the Eagle Lake, Wharton, and Brownsville districts in Texas; the Alexandria and Bayou Lafourche

districts in Louisiana; and the Mobile, Ala., district. Many other sections might be mentioned, such as Kissimmee, Plant City, Arcadia, Moore Haven, Okeechobee, Miami, and Dupont in Florida.

SOIL.

Generally speaking, the soils of the sections where the early potato crop is grown are light sandy loams. Such soils warm up early, are easily prepared, and usually are well drained.

CROP ROTATION.

No definite crop-rotation system is practiced in any of the leading commercial potato-producing centers in the South. In the Hastings district in Florida it seems to be the rule rather than the exception to grow potatoes year after year upon the same land. Under such conditions the only rotation is that of following the early crop of potatoes with some other crop, such as corn, cowpeas, velvet beans, beggarweed, sugar cane, cotton, or hay. The corn and the sugar cane are frequently planted before the potato crop is harvested. Cowpeas are often sown in the corn when it is given its last cultivation. When the corn stover and the cowpeas are cut and properly cured they furnish an excellent feed for live stock during the winter. Farther north, where the potatoes are harvested at a later date, a longer rotation is generally practiced; onions, cabbage, spinach, kale, strawberries, or other crops may be grown, either as an intercrop or alternately with potatoes.

As a rule, the potato industry of the South could be materially improved by adopting a system of crop rotation which would insure the addition to the soil of a larger amount of organic matter.

PREPARATION OF THE SOIL.

One of the most prevalent mistakes made in the production of early-crop potatoes in the South is plowing the land too shallow. Wherever the surface soil will permit, it should be plowed to a depth of from 8 to 10 inches. The depth, however, must be governed by that of the surface soil. If the surface soil is only 5 inches, plow 6 inches deep. Never turn up more than an inch of subsoil at any one time. The plowing should be done sufficiently long in advance of the planting date to permit partial decomposition of the vegetable matter, such as corn stover, cowpeas, or other preceding crops which have been turned under. In Florida the land for the early crop is usually plowed in the latter part of November or in early December. The usual way is to plow it into rather narrow ridges or beds. This insures better drainage and consequently permits an earlier preparation of the land. Such a treatment of the soil gives more favorable conditions for the decomposition of the corn stover, cowpeas, or other coarse vegetable matter turned under.

A few days prior to planting the crop the land should be thoroughly fitted by the use of a disk or a cutaway harrow, after which it may be fined with a smoothing harrow, followed by a plank drag if the soil is cloddy. The main object should be to prepare the land thoroughly for the reception of the crop. Land that is lumpy or that is filled with coarse undecayed organic matter as a rule will not produce as large a crop as soil which is in a loose friable condition and in which the organic matter is fairly well decomposed.

COMMERCIAL FERTILIZERS.

The customary method of applying commercial fertilizer is to open a furrow, a week or 10 days before planting, with a middle buster or turnplow and then distribute a portion of the fertilizer in the furrow thus made, after which it is thoroughly mixed with the soil, usually with a 1-horse spike-tooth cultivator. A second application is made just prior to dropping the seed. The commercial fertilizer is applied early, with the idea that during the interim between its application and the planting of the crop some of the plant food will have become diffused through the soil and thus be immediately available to the plants as soon as they have reached a point of growth at which they can use it.

The fertilizer when so applied is usually distributed by a 1-horse or 2-horse fertilizer distributor, which sows it in three furrows at once. However, the use of the 2-horse potato planter with a fertilizer-distributing attachment is gradually supplanting the older method of applying commercial fertilizers.

GRADE OF FERTILIZER.

As a rule, a high-grade commercial fertilizer is used, the object of the grower being to force the crop to maturity as rapidly as possible. A fertilizer that has found much favor in the Virginia trucking sections is one that contains 7 per cent of ammonia,[1] 6 per cent of phosphoric acid, and 5 per cent of potash. The high percentage of ammonia stimulates a quick and strong growth of stem and leaf, thus giving the plant an early start.

Another favorite fertilizer contains 5 per cent of ammonia, 8 per cent of phosphoric acid, and 5 per cent of potash.

The nitrogen or ammonia content of both of these brands of fertilizer should be derived in part from salts, such as nitrate of soda or sulphate of ammonia, in which it is immediately available, and in part from the slower organic sources of nitrogen, such as cottonseed meal, fish scrap, and dried blood. The reason for this is that the nitrogen from the nitrate of soda or sulphate of ammonia is used

[1] All commercial fertilizer manufacturers use the term ammonia rather than nitrogen in their guaranteed analyses. Thus, a 7-6-5 fertilizer has only 5.76 per cent of nitrogen. A unit of ammonia equals 0.823 of a unit of nitrogen.

by the plant in the early stages of its growth, while that from the organic sources, being more slowly available, supplies the needs of the plant in the later stages of its development.

Standard fertilizers containing the percentages of ammonia, phosphoric acid, and potash shown in Table III have been recommended for the early and late crops of potatoes grown on sandy, loam, and clay soils.

TABLE III.—*Fertilizer formulas for growing potatoes on different soils.*[1]

Crop.	Sandy soil.	Loam soil.	Clay soil.
Early potatoes	7–6–5	5–8–5	4–8–4
Late potatoes	2–10–6	2–10–6	

[1] The figures given show the percentages of ammonia, phosphoric acid, and potash, respectively.

AMOUNT OF FERTILIZER TO APPLY.

In the Atlantic Seaboard States, or, as the area is more familiarly known, the Coastal Plain section of the South, it is customary to apply from 1,800 to 2,000 pounds of high-grade fertilizer per acre. Occasionally a grower uses 2,500 pounds.

In the other States, with the possible exception of the Louisville district in Kentucky, very much smaller quantities of fertilizers are used; in fact, in some sections, as in Texas, little, if any, fertilizer is applied to the crop. It is probable that a judicious use of commercial fertilizers, coupled with a rational system of crop rotation, would prove a profitable investment for growers who are not now using fertilizers.

It should not be forgotten, however, that maximum results from the use of commercial fertilizers can only be secured on land reasonably well filled with decaying vegetable matter. As a rule, too little attention has been given to this matter by the potato grower. The turning under of a crop of crimson clover, cowpeas, beggarweed, or other leguminous crop is a valuable aid to the production of a maximum crop of potatoes. Cornstalks, hay, and cowpea or soy-bean stubble help to furnish organic matter, but do not provide as much fertility as when the whole crop is turned under. The presence of this organic matter makes the soil more retentive of moisture, prevents its running together or washing in heavy rains, renders it easier to cultivate, and by gradual decomposition furnishes considerable plant food to the growing crop. The increased moisture serves to dissolve the plant food in the commercial fertilizer and to render it available to the plant.

A still further advantage derived from the turning under of clovers or other leguminous or even nonleguminous crops is that the quantity of commercial fertilizer may be appreciably reduced. Applications of 1,200 to 1,500 pounds per acre will be found to be quite as effective on soils well supplied with organic matter as 1,800 to 2,500 pounds on those that have little or no organic matter in them.

BARNYARD MANURES.

Where farm manure is available, it is recommended that it be applied at the rate of 10 to 12 tons per acre. In most cases it is desirable to broadcast the manure on the land previous to plowing it. If this is not feasible or if there is danger of its leaching away when the land is fall plowed, it may be applied before fitting the land for planting and thoroughly disked into the soil. Such an application of manure should be supplemented by 800 to 1,000 pounds of 2–8–2 fertilizer[2] applied in the row at the time of planting. Barnyard manure, in itself, is not a well-balanced plant food, being too rich in nitrogen for its phosphorus content, and inducing a rank vine growth at the expense of tuber development.

The combination of these two applications gives the desired fertility in approximately the proper ratio and at the same time supplies the necessary organic matter. Farm manures should not be applied to land known to be infected with the organism causing the common scab of the tubers, at least not to the potato crop, as it has a decided tendency to increase the percentage of scab-infected tubers.

EARLY VARIETIES.

The varieties usually grown in the Southern States for the early market are the Irish Cobbler (fig. 1), Triumph (fig. 2), and Spaulding No. 4 (fig. 3), also known as Spaulding's Rose or Rose No. 4. The relative commercial importance of these three varieties is in the order in which they are mentioned.

The Irish Cobbler is almost exclusively grown in the Coastal Plain States, extending from Delaware to Georgia. It is also grown in the Louisville district of Kentucky, and in some sections of Alabama.

FIG. 1.—A good type of potato of the Irish Cobbler variety.

The Triumph is grown in southern Florida, Alabama, Mississippi, Louisiana, Texas, Oklahoma, Arkansas, and Tennessee.

[2] A brief way of stating the percentage of ammonia, phosphoric acid, and potash, respectively, contained in a commercial fertilizer.

The Spaulding No. 4 is grown in central and northeastern Florida, particularly in the Hastings district. In southern Louisiana, in the Bayou Lafourche district, the White Star, a member of the Burbank group, is quite popular.

FIG. 2.—Typical tubers of the Triumph variety.

PRODUCTION OF GOOD SEED.

During recent years considerable attention has been given to the production of good seed potatoes, and the indications are that this subject will receive still greater attention in the future. Good seed may be defined as seed that is true to name and type of the variety and free from injurious diseases. It should be reasonably uniform in

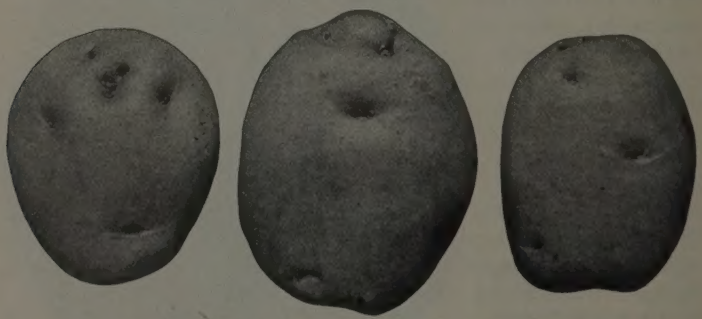

FIG. 3.—Typical tubers of the Spaulding No. 4 variety as grown at Hastings, Fla.

shape and size, produced by strong-yielding and disease-free plants, and harvested when somewhat immature. Also it should have been grown under favorable environmental conditions.

For further information in regard to good seed, see Farmers' Bulletin 533, entitled "Good Seed Potatoes and How to Produce Them," and Circular No. 5 of the Office of Cotton, Truck, and Forage Crop Disease Investigations, entitled "Growing High-Grade Potato Seed Stock."

CERTIFIED SEED.

An attempt is now being made to produce the kind of seed described by inspection of the growing crop once or twice, preferably twice, during the growing season, for the purpose of noting the number of varietal mixtures and the presence or absence of diseased plants. If the percentage of mixtures or of any of the transmissible diseases exceeds a certain minimum tolerance, the field is rejected. All mixtures or diseased plants in fields thought worthy of consideration by the inspector are supposed to be removed before the field is harvested. An examination of the harvested tubers in the bin completes the inspection, and if the stock is found to conform to the requirements it is given a certificate. All certified seed stock when put up for shipment is tagged with certification tags issued by the State inspector.

Certified seed should and does command a premium over uninspected seed stock. The degree of its superiority is largely governed by the rigidity of the inspection service. Careless inspection of seed stock or the granting of a certificate to inferior stock restricts rather than increases the demand for good seed.

NORTHERN-GROWN SEED.

A large proportion of the seed stock used in planting the early crop in the South is purchased from growers in the North. Aroostook County, Me., produces a large proportion of the Irish Cobbler and Spaulding No. 4 and a small part of the Triumph seed stock used in planting the southern crop. Wisconsin, Minnesota, and northwestern Nebraska supply a large percentage of the Triumph seed stock and a comparatively small part of that of the Irish Cobbler and Spaulding No. 4. The practice of using northern-grown seed results from the fact that in most sections of the South it is not possible to produce seed stock having the same vigor as that grown in the North.

HOME-GROWN SEED.

The production of home-grown seed stock in the South is only practiced in localities where it is possible to grow second-crop potatoes, as, for example, in the Fort Gibson and Fort Smith districts in Oklahoma and Arkansas, the Louisville district in Kentucky, and the Eastern Shore of Virginia and Maryland. In Oklahoma and Arkansas, where the seed from the first crop is used for the second crop, planting the seed stock from the second crop, known to the trade as "junior seed," is generally regarded by the growers of that region as superior to northern-grown seed stock for early-crop planting the following season. In the Louisville and the Eastern Shore of Virginia and Maryland districts, where northern-grown seed of the previous season's growth is used in planting the second crop, the seed thus produced has proved as satisfactory as northern-grown seed for

the planting of a portion, at least, of the early crop. The growers on the Eastern Shore of Virginia and Maryland are now planting from 50 to 60 per cent of their acreage with home-grown second-crop seed. That home-grown seed does not entirely supplant northern-grown seed in the sections mentioned is due to the fact that the northern-grown seed germinates more quickly and reaches market maturity from a week to 10 days earlier than that which is home grown.

It is desirable, therefore, to plant a portion of the acreage with northern-grown seed, so that marketing may begin a little earlier and as a rule secure somewhat better returns. This early acreage keeps the harvesting crews occupied until the crop from the slower developing home-grown seed is ready to be marketed and prolongs the marketing period.

METHOD OF PURCHASE AND SHIPMENT OF NORTHERN-GROWN SEED.

The usual practice in the purchase of seed stock from northern growers is to buy in the late summer, autumn, or early winter. The terms of purchase are generally on the basis of delivery a few weeks prior to the planting period. The northern grower stores the crop and ships during the winter. Shipments of seed stock to Florida must go forward in November or early in December.

The particular feature of this movement of northern-grown seed stock to the South to which it is desired to call special attention is the risk of injury to the seed stock from being frozen or chilled in transit or of portions of the shipment becoming overheated when stoves are used for heating the car. Many promising lots of seed stock have been seriously injured in this manner. It is believed that it would be to the advantage of the southern grower to purchase his northern-grown seed stock subject to fall delivery and provide on his own farm or in a community storage house the necessary storage facilities to care for the seed until it is required for use. This would obviate the risk of injury in transit, insure a more prompt delivery, and save the cost of storage in the North. The price for fall delivery is usually about $1 a barrel less than that demanded by northern growers for winter delivery. The cost of providing suitable storage could therefore be largely, if not wholly, met by the saving effected in purchasing for fall delivery. If the present inadequate transportation facilities continue, another important reason in favor of fall delivery is obvious.

QUANTITY OF SEED REQUIRED PER ACRE.

The quantity of seed required to plant an acre of potatoes is very largely governed by the size of the tubers and of the seed pieces, the variety, and to a much larger extent by the spacing of the rows and of the plants in the row. Large potatoes do not cut to such good advantage as medium-sized tubers.

The average quantity of seed used in planting an acre of potatoes in the United States is between 8 and 9 bushels, or 480 to 540 pounds. In all probability this is somewhat in excess of the average for the Southern States, because the seed stock used by the southern grower represents a greater cash outlay per pound than that used by the northern grower; hence, economy in its use is more necessary than in the North.

A more liberal use of seed by the southern grower probably would be found profitable, in normal years at least. All record-making yields either in this country or in foreign lands involve the use of an unusually large quantity of seed, in some instances approaching 100 bushels per acre. With seed stock selling at a reasonable price, the use of 12 to 15 bushels of seed per acre is recommended.

Table IV gives the quantity of seed required to plant an acre when cut to a given weight, with the rows and hills spaced at different distances apart.

TABLE IV.—*Quantity of potatoes required to plant an acre at different spacings with seed pieces of various sizes.*

Spacing of rows and seed pieces.	Seed required, the average weight of seed pieces used being as given.						
	½ ounce.	¾ ounce.	1 ounce.	1¼ ounces.	1½ ounces.	1¾ ounces.	2 ounces.
Rows 30 inches apart:							
8-inch spacing.....bushels..	13.6	20.4	27.2	34.0	40.8	47.6	54.4
10-inch spacing.....do....	10.9	16.3	21.8	27.3	32.6	38.1	43.6
12-inch spacing.....do....	9.1	13.6	18.2	22.7	27.2	31.8	36.3
14-inch spacing.....do....	7.8	11.7	15.6	19.4	23.3	27.2	31.1
16-inch spacing.....do....	6.8	10.2	13.6	17.0	20.4	23.8	27.2
18-inch spacing.....do....	6.0	9.1	12.1	15.1	18.2	21.2	24.2
24-inch spacing.....do....	4.5	6.8	9.1	11.3	13.6	15.9	18.2
36-inch spacing.....do....	3.0	4.5	6.0	7.5	9.1	10.6	12.1
Rows 32 inches apart:							
8-inch spacing.....do....	12.8	19.1	25.5	31.9	38.3	44.7	51.1
10-inch spacing.....do....	10.2	15.3	20.4	25.5	30.6	35.7	40.8
12-inch spacing.....do....	8.5	12.8	17.0	21.3	25.6	29.8	34.0
14-inch spacing.....do....	7.3	10.9	14.6	18.2	21.9	25.5	29.2
16-inch spacing.....do....	6.4	9.6	12.8	16.0	19.2	22.4	25.6
18-inch spacing.....do....	5.7	8.5	11.3	14.2	17.0	19.8	22.7
24-inch spacing.....do....	4.3	6.4	8.5	10.6	12.7	14.9	17.0
36-inch spacing.....do....	2.8	4.2	5.7	7.1	8.5	9.9	11.3
Rows 34 inches apart:							
8-inch spacing.....do....	12.0	18.0	24.0	30.0	36.0	42.0	48.0
10-inch spacing.....do....	9.6	14.4	19.2	24.0	28.8	33.6	38.4
12-inch spacing.....do....	8.0	12.0	16.0	20.0	24.0	28.0	32.0
14-inch spacing.....do....	6.9	10.3	13.7	17.1	20.6	24.0	27.4
16-inch spacing.....do....	6.0	9.0	12.0	15.0	18.0	21.0	24.0
18-inch spacing.....do....	5.3	8.0	10.7	13.3	16.0	18.7	21.4
24-inch spacing.....do....	4.0	6.0	8.0	10.0	12.0	14.0	16.0
36-inch spacing.....do....	2.5	3.8	5.0	6.3	7.6	8.8	10.1
Rows 36 inches apart:							
8-inch spacing.....do....	11.3	17.0	22.7	28.4	34.0	39.7	45.4
10-inch spacing.....do....	9.1	13.6	18.1	22.7	27.2	31.7	36.3
12-inch spacing.....do....	7.6	11.3	15.1	18.9	22.7	26.5	30.2
14-inch spacing.....do....	6.5	9.7	13.0	16.2	19.4	22.7	25.9
16-inch spacing.....do....	5.7	8.5	11.3	14.2	17.0	19.8	22.7
18-inch spacing.....do....	5.0	7.6	10.1	12.6	15.1	17.6	20.2
24-inch spacing.....do....	3.8	5.7	7.6	9.5	11.3	13.2	15.1
36-inch spacing.....do....	2.5	3.8	5.0	6.3	7.6	8.8	10.1
Rows 42 inches apart:							
8-inch spacing.....do....	4.3	6.5	8.6	10.8	13.0	15.1	17.3
24-inch spacing.....do....	3.2	4.9	6.5	8.1	9.7	11.3	13.0
30-inch spacing.....do....	2.6	3.9	5.2	6.5	7.8	9.1	10.4
36-inch spacing.....do....	2.2	3.2	4.3	5.4	6.5	7.6	8.6
Rows 48 inches apart:							
8-inch spacing.....do....	3.8	5.7	7.6	9.5	11.3	13.2	15.1
24-inch spacing.....do....	2.8	4.2	5.7	7.1	8.5	9.9	11.3
30-inch spacing.....do....	2.3	3.4	4.5	5.7	6.8	7.9	9.1
36-inch spacing.....do....	1.9	2.8	3.8	4.7	5.7	6.6	7.6

TREATMENT OF SEED FOR SURFACE DISEASES.

Although the value of seed treatment has been repeatedly demonstrated, a comparatively small percentage of the seed stock planted in the South is disinfected. The object of seed treatment is to destroy the organisms causing common scab and the resting stage (sclerotia) of the black-scurf fungus, scientifically known as *Rhizoctonia solani*. The disinfectant used also destroys the surface spores of various saprophytic organisms which might affect the health and vigor of the plants.

In treating seed potatoes, the grower has a choice of two disinfectants, the corrosive-sublimate and formalin solutions. They are equally effective in destroying the organism of the common scab. The corrosive-sublimate solution is so much more effective against the black-scurf infection on the seed tubers to be treated as to justify its use.

The formulas recommended for these solutions are as follows:

Formalin solution: 1 pint of formalin to 30 gallons of water.

Corrosive-sublimate (bichlorid of mercury) solution: 4 ounces of corrosive sublimate dissolved in 30 gallons of water.[3]

PERIOD OF TREATMENT.

The length of treatment should be varied somewhat, depending upon the condition of the seed stock and its freedom from disease. Badly germinated seed potatoes should not be immersed in the solution for more than one-half to three-quarters of an hour. Likewise, if they are practically free from scab or black scurf a similar period of treatment will be sufficient. Tubers that are dormant or that show scab or black-scurf infection may be immersed for 1½ to 2 hours without material injury to their germinating powers.

The tubers are most easily handled by placing them in a burlap sack or by putting them in slat crates and immersing the crates. They should be spread out to dry immediately on removal from the solution.

It is preferable to treat all seed stock before cutting, as there is less likelihood of injuring it when whole. Treated seed should be placed only in containers that have been disinfected.

Disinfection of the seed stock is not necessarily a guarantee of disease-free progeny unless the land in which the plants are grown is free from infection. Both the scab and black-scurf organisms are capable of living in the soil for many years after the growth of a potato crop.

[3] Corrosive sublimate dissolves very slowly in cold water, but quickly in hot water. It is therefore recommended that it be dissolved in 1 or 2 gallons of hot water and then diluted to 30 gallons. Metal vessels should not be used, as the corrosive sublimate corrodes them. Corrosive sublimate is a deadly poison when taken internally, and every precaution should be used to guard against persons or animals drinking it.

CUTTING THE SEED.

In preparing seed potatoes it is very desirable to cut them so as to give blocky rather than wedge-shaped pieces (fig. 4). If good seed is scarce and high priced, it may be permissible to cut to single-eye pieces, provided the seed bed is especially well prepared and the conditions for germination are satisfactory. It should be remembered that the smaller the size of the seed piece the more necessary it becomes to have the growing conditions as favorable as it is humanly possible to make them.

If the land is poorly prepared, that is, lumpy or cloddy, rather than well pulverized, or if it is lacking in moisture, poorly drained, or deficient in available plant food, the small-sized seed piece will not give as good results as a large piece. Ordinarily the seed bed is

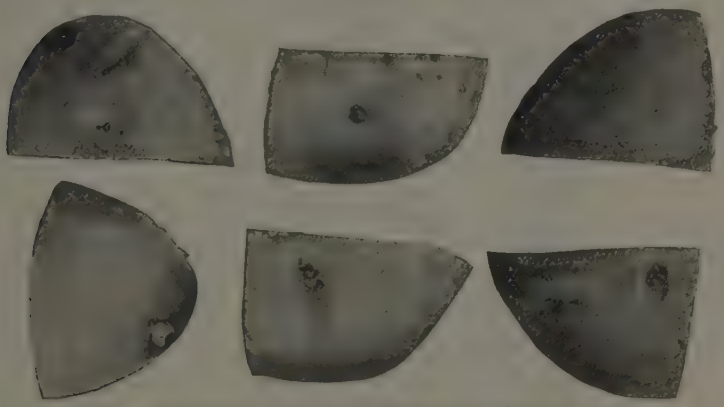

FIG. 4.—Potato seed cut into chunky rather than thin wedge-shaped pieces.

not too well prepared; hence, there are many skips or misses in the field if the seed is cut too small. It is believed that better results will be obtained by the use of seed pieces having two or three eyes, as there is less likelihood of failure to produce reasonably good plants in case the growing conditions are unfavorable.

There are many mechanical potato cutters, most of which are operated by hand. Although such machines greatly reduce the labor involved in cutting potato seed, they are not fully satisfactory, since their use results in many pieces having no eyes. As such pieces can not germinate, they increase the number of missing plants and reduce the yield proportionately.

Varieties containing numerous eyes that are well distinguished, such as the Burbank, Early Rose, and Early Ohio, lend themselves better to the automatic seed cutter than the Irish Cobbler or Triumph. Wherever possible, it is desirable to cut the seed potatoes by hand.

The labor of hand cutting may be very materially reduced by constructing a cutting box or hopper to which the knife used is rigidly fastened in an upright position with the back of the blade toward the operator (fig. 5). With such an equipment the cutting capacity of an individual can be practically doubled and at the same time the drudgery of the work materially lessened.

CARE OF THE CUT SEED PRIOR TO PLANTING IT.

Many poor stands in commercial potato fields are due to the improper handling of the freshly cut seed. Most, if not all, such

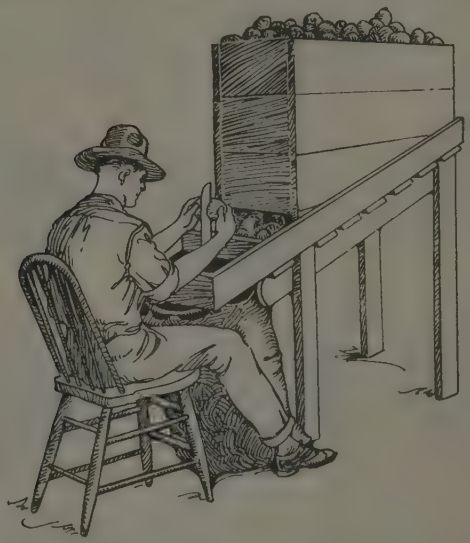

FIG. 5.—A potato seed-cutting box which makes it possible to cut a much larger quantity in a day and with a less expenditure of energy than by using a knife in the hand.

injury is caused through failure on the part of the grower to realize that the vitality of seed stock may be very quickly injured through overheating when stored in bulk or by an hour or two of exposure to sun and wind. It should be borne in mind that the seed potato is a living organism involving much the same vital processes as in animal life.

When freshly cut seed is stored in bulk, or even in a sack or barrel during warm weather, a considerable degree of heat is generated, which if not quickly dissipated soon seriously injures the vitality of the stock; in fact, so quickly does the temperature of the seed stock reach the danger point that the injury has often occurred before the grower realized it. This injury in its milder form results in delayed

germination and in weak plants, and in its severer form it causes the failure of many of the seed pieces to germinate. When the seed is planted as soon as cut there is little opportunity for such injury unless it is exposed to the sun for an hour or more before being planted or there is too great a delay in covering after dropping by hand.

The proper way to handle cut seed, when it has been prepared some time in advance of its use, is to spread it out rather thinly, say 6 to 8 inches deep, on a board or dirt floor in a shed or barn and turn it over once or twice during the first 24 hours, repeating the operation at least once each day for the next three or four days, or until the cut surfaces are dry. Then it may be crated, sacked, barreled, or stored in bulk until required for use, provided it is kept in a cool place. Some years ago the writer was startled to learn that in the Louisville district in Kentucky it was more or less customary for the growers to cut their seed potatoes during the months of December and January, when other farm work was not pressing. Not only was the seed stock cut for the early crop, but for the fall or second crop as well. In other words, seed was cut in December and January, some of which was intended for planting the following July. The cut seed in this case was properly cured, then barreled, and on the approach of warm weather was placed in cold storage.

It is desirable to dust freshly cut seed with land plaster, air-slaked lime, ground limestone, or flowers of sulphur in order to absorb the moisture of the freshly cut surfaces, as this serves to prevent heating if the seed is to be held for some time; or if the seed is to be planted immediately it prevents adhesion of the seed pieces and thereby makes it possible for the automatic machine planter to do a more perfect job.

PLANTING DATE.

The planting dates involved in the production of early-crop potatoes vary from the latter part of November in southern Florida to the latter part of April in West Virginia. The approximate date of planting in each of the 16 States under consideration is given in Table V, which also includes, for the purpose of easy reference and comparison, the dates of planting the late or main crop and the fall crops of potatoes.

As a rule, the sole factor in determining the date of planting the early crop of potatoes in the South is that of late spring frosts. The grower aims to plant just as early in the season as in his judgment it is safe; in fact, not a single early crop of potatoes is produced in the South which has not been subject to some risk from frost injury during some portion of the growing season.

TABLE V.—*Approximate dates of planting the early, late, and fall crops of potatoes in the Southern States.*[1]

State.	Date of planting.		
	Early crop.	Late or main crop.	Fall crops.
Alabama	Jan. 15 to Feb. 15		Aug. 15 to Sept. 15.
Arkansas	Feb. 15 to Mar. 30		June 25 to Aug. 15.
Delaware	Mar. 20 to Apr. 30	Apr. 25 to May 25	June 25 to July 20.
Florida	Nov. 20 to Mar. 1		Sept. 1 to Oct. 1.
Georgia	Jan. 15 to Feb. 15	Apr. 25 to May 25	Aug. 1 to Sept. 1.
Kentucky	Mar. 1 to Apr. 10	Apr. 15 to May 20	July 1 to July 25.
Louisiana	Jan. 15 to Mar. 10		Aug. 15 to Sept. 15.
Maryland	Mar. 1 to Apr. 25	Apr. 25 to June 5	June 20 to July 20.
Mississippi	Jan. 15 to Feb. 25		Aug. 15 to Sept. 1.
North Carolina	Feb. 15 to Mar. 25	Apr. 25 to May 30	July 10 to Aug. 10.
Oklahoma	Feb. 15 to Mar. 30		June 15 to July 10.
South Carolina	Feb. 1 to Mar. 15	Apr. 20 to May 25	July 15 to Aug. 20.
Tennessee	Mar. 1 to Apr. 10	Apr. 15 to May 20	July 10 to Aug. 1.
Texas	Jan. 1 to Mar. 15	Apr. 1 to May 15	July 1 to Sept. 1.
Virginia	Feb. 15 to Apr. 1	Apr. 20 to May 25	July 1 to Aug. 10.
West Virginia	Mar. 15 to Apr. 30	Apr. 25 to May 30	June 25 to July 10.

[1] The data presented are based in part upon information obtained from the Bureau of Crop Estimates of the United States Department of Agriculture and partly on the writer's personal knowledge of the dates of planting in many of the States.

PLANTING METHODS.

The potato crop may be planted either by hand or with a machine. When planted by hand the usual practice is to drop the seed pieces in an open furrow, after which they are covered by using a 1-horse or 2-horse turnplow to throw a furrow over them from both directions. When a machine planter is used the furrow is opened and the seed dropped and covered by the machine in one operation. If the planter has a fertilizer-distributing attachment, the fertilizer may be applied at the same time.

When a machine planter is used, an extra covering of soil should be given, in order to protect the seed from frost. In some instances rather heavy losses have been incurred through failure on the part of the grower to appreciate the necessity of an additional layer of soil. The soil is most easily applied with a turnplow or a disk horse hoe.

There are two general types, known as the 1-man and the 2-man planters. The 1-man planter distributes the seed by means of pickers or forks attached to a vertical revolving disk which revolves through the cut seed chamber. As each fork passes it is supposed to transfix a seed piece; then, as it passes over the dropping tube, the seed is stripped off the fork and dropped into the tube. When the seed is properly cut, that is, in blocky rather than wedge-shaped pieces, and the cut seed pieces do not stick together, the pickers seldom fail to pick up a seed piece.

Each failure of one of the pickers to impale a seed piece as it revolves through the seed chamber means a missing plant or skip in the row, or if it picks up two seed pieces it means two plants where only one is intended. Where all the conditions are satisfactory such a planter will give an almost perfect stand. As a

matter of fact, however, it is seldom that such conditions are secured, and stands of 80 to 90 per cent are the rule.

The 2-man planter distributes the seed pieces by an altogether different device. They are removed from the hopper or seed chamber by means of a sprocket wheel revolving at an angle of about 45°, which drops the seed pieces on a revolving horizontal disk with pockets. A single seed piece is supposed to fall into each pocket, from which it is discharged as it is carried over the dropping tube. It so happens, however, that two or more seed pieces are occasionally dropped into a pocket or that some pocket is not supplied with a seed piece. The function of the second man, who sits at the rear of the horizontal disk, is to correct these inaccuracies by removing all extra seed pieces and supplying missing ones. With a reliable man to correct the defects of the machine it is possible to secure a 100 per cent perfect stand. The extra cost of an additional man on the planter is much more than repaid by the increased yield resulting from the more perfect stand of plants.

RATE OF PLANTING OR SPACING.

Considerable variation in row spacing may be noted in the different commercial potato-producing areas in the South, particularly where interplanting occurs or where the crop is planted on raised beds. The spacing between rows varies from 30 to 42 inches, and where interplanting occurs the space may be as much as 60 inches. Under normal conditions early varieties should be grown in rows 30 to 32 inches apart and the plants in the row 10 to 14 inches apart, depending on the natural fertility of the soil, the moisture supply, and more especially the size of the seed pieces. The larger the size of the seed pieces used the greater should be the spacing between the plants. The aim should be to space the rows and plants so as to secure a maximum yield of merchantable tubers per acre and at the same time permit horse cultivation between the rows.

DEPTH OF PLANTING.

The early crop should not be planted as deep as the late one. On most soils a depth of 3 to 4 inches is sufficient. Where the ridge system of cultivation is practiced, as in the case of the irrigated areas in Florida, the seed piece is not planted more than 2 inches below the actual ground level. Protection against late winter or spring frosts is provided by throwing a heavy ridge of soil over the seed pieces. The seed pieces on heavy soils should be planted shallower than on light soils.

CULTIVATION.

The cultivation of the crop should begin shortly after it is planted. Every effort should be made to keep the surface soil loose, and the germinating weed seeds should be destroyed as fast as they appear.

The weeder or a spike-tooth harrow, so constructed that the teeth can be slanted backward, is a very satisfactory implement to use in keeping the newly planted field in good condition until after the plants are well above the surface. When the plants have grown sufficiently to outline the rows clearly, the first deep cultivation should be given. The 2-horse riding cultivator is an excellent implement to use after the plants are up (fig. 6). The land between the rows should be stirred as deeply as possible, 6 inches or more. Where ridging is practiced, the newly cultivated soil is ridged with a 1-row or 2-row wing or disk horse hoe, which draws or throws the soil around or over the plants.

After this first deep cultivation the subsequent workings should be shallower and shallower and farther and farther away from the

FIG. 6.—Giving the potato crop its first deep cultivation.

plants, the object being to do as little root pruning as possible and at the same time to reduce to a minimum the labor with the hand hoe. Cultivation should be repeated as often as may be necessary to keep the soil open and free from weeds until the plants have reached such a size that it is no longer possible to cultivate them without doing more harm than good (fig. 7).

SPRAYING.

The potato crop is sprayed for two reasons, viz, as a protection against insect enemies and as a preventive of fungous diseases, which frequently destroy the plants.

The common insect pests of the potato in the South are the Colorado beetle and the flea beetle. Occasionally plant lice cause considerable injury, but as a rule they are not abundant. All leaf-eating insect enemies of the potato with the exception of the flea beetle are readily destroyed by spraying the foliage with some form

of arsenical poison, such as arsenate of lead, arsenite of zinc, or Paris green. The lead arsenate and the arsenite of zinc are preferred to Paris green because there is no risk of burning the foliage. When Paris green is used in a liquid form a small quantity of lime, say 2 pounds to 50 gallons of the liquid, should be added in order to prevent burning the foliage with the free arsenious acid which it contains.

The flea beetle is not readily controlled by arsenical poisons; therefore other remedies must be used, and among these is Bordeaux mixture, which is one of the sprays used to prevent blight.

In spraying for plant lice it is necessary to use a contact insecticide, such as a solution of nicotine sulphate or kerosene emulsion,

FIG. 7.—A potato field in which no further cultivation should be attempted, because cultivation would do more harm than good.

which kills by contact with the bodies of the plant lice, because these lice are sucking rather than leaf-eating insects.

The two diseases of the potato plant controllable by spraying with fungicides are the early-blight and the late-blight. Neither of these diseases is so prevalent in the regions of the South where early-crop potatoes are produced as in those sections of the northeastern United States where late-crop potatoes are grown. Consequently the practice of spraying as a protection against fungous diseases is not very general in the South. The early-blight, however, is of more general occurrence than the late-blight, and is not so easily controlled. Late-blight visitations are more frequent in Florida, Virginia, and Maryland than in the other States. Bordeaux mixture is the best preventive of these two blights. Plants well sprayed

with this mixture are not so seriously injured by the flea beetle as are those whose foliage is not thus protected (fig. 8).

Spray formulas.—Four insecticide spray formulas are suggested and the formula for Bordeaux mixture is also presented below.

1. Arsenate of lead, 3 to 5 pounds; water, 50 gallons.
2. Arsenite of zinc, 1½ to 2 pounds; water, 50 gallons.
3. Paris green, 12 ounces; water, 50 gallons; lime, 2 pounds.
4. Nicotine sulphate, one-half to three-fourths of a pint; water, 50 gallons; soap, 5 ounces.

Bordeaux mixture.—Copper sulphate (blue vitriol), 5 pounds; lime, 5 pounds; water, 50 gallons.

The presence or absence of insect pests determines the frequency of spraying with insecticides, and the climatic conditions and locality

FIG. 8.—Field apparatus for filling the spray tank, which makes it possible to spray a much larger area in a day than where the sprayer is taken to a filling station.

are the factors determining the desirability of spraying the plants with Bordeaux mixture as a protection against early-blight and late-blight.[4]

The labor involved in making Bordeaux mixture and the time taken in filling the spray tank may be greatly lessened by erecting an elevated spray-mixing platform (fig. 9).

DATE OF HARVESTING THE CROP.

The early potato crop is usually harvested before it is mature. The desire of the grower to obtain the higher prices which are usually paid for the new crop serves as an incentive to harvest the potatoes oftentimes before they are really fit for shipment and certainly before they have reached maximum size. The general result of such action is to prevent a normal yield of the crop, and it very often brings unsatisfactory returns in dollars and cents. There are, however, seasons in which the market price falls so rapidly after the shipments

[4] For further details concerning the spraying of potatoes, the grower should consult Farmers' Bulletin 98, entitled, "How to Increase the Potato Crop by Spraying," which may be had free on request to the United States Department of Agriculture.

become heavy that the grower who harvests his crop early actually receives more money for his small yield than would have been obtained from a larger crop later on. Each grower must decide for himself whether he is justified in taking the smaller yield in order to market his crop early. The grower in southern Florida who plants his early crop in the latter part of November may, under favorable conditions, begin to dig his crop in the latter part of February, but aside from very small commercial areas in southern Florida, and possibly in the

FIG. 9.—Spray-mixing platform at the Virginia Truck Experiment Station, Norfolk, Va. The solution of copper sulphate and lime flows directly from the dilution barrels into the tank, passing through a brass-wire strainer on its way.

Brownsville district in Texas, the harvesting of the early crop may be said to begin in the latter part of March and continue throughout the spring and early summer, ending in the northern portion of the southern group of States in August. Approximate dates of harvesting are shown in Table II.

METHOD OF HARVESTING THE CROP.

The early potato crop is harvested in various ways. Formerly much of the early crop was dug with a 1-horse or 2-horse turnplow (fig. 10), after which the potatoes were "grabbled" out of the up-

turned furrow by the pickers, consisting very largely of women and children, and thrown into small piles (fig. 11). The tubers were then graded as gathered, and barreled. At the present time elevator diggers have very largely supplanted the old-time method (figs. 12 and 13).

Harvesting operations may be hastened or delayed according to the prices prevailing during or preceding the usual period of digging. For example, if high prices prevail when the crop is reaching marketable size the grower may be tempted to dig earlier than is advisable, but if the price is low, digging may be delayed for several weeks in the

FIG. 10.—Digging potatoes with a turnplow, a common method of harvesting the crop in the Southern States. High-priced labor and its scarcity are compelling the grower to use the more modern diggers.

expectation of receiving a better price or with the certainty of a larger yield. In the States of the extreme South harvesting can not, as a rule, be delayed beyond a few weeks, because a succession of crops has either been planted, after the last cultivation of the potatoes, or else is to be planted immediately after the removal of the standing crop and must be given a chance to occupy the ground. In the northern tier of the Southern States the ensuing crop is not of such vital importance, although ordinarily corn or some other crop follows the potato crop.

If prices are high, therefore, the harvesting period is early and is quickly over; but if they are low it may be very materially delayed and also extended over a considerable period of time.

PACKAGES.

The packages or containers in which the early potato crop is shipped to market vary in different commercial areas. For example, in the southern part of Florida the growers ship the potatoes in hampers containing about 50 pounds. In the Hastings district in Florida the crop is marketed in double-headed stave barrels (fig. 14) as long as the supply of barrels lasts. When that supply is exhausted the remainder of the crop is marketed in 150-pound burlap sacks. Occasionally, some potatoes are shipped in hampers.

The Georgia growers ordinarily ship in burlap-covered stave or slat barrels (figs. 15 and 16). In the Beaufort section of South Carolina the crop is largely shipped in specially constructed slat barrels reinforced with an extra set of hoops, placed on the inside of the barrels opposite the outer ones. This adds very considerably to the rigidity of the barrel. The top of the barrel is covered with burlap. From the Beaufort area north to Delaware the customary package is the cloth-top stave or slat barrel. In Alabama, Mississippi, Louisiana, Texas, Oklahoma, and Arkansas the usual container is a burlap sack holding from 90 to 115 pounds. In the Louisville district in Kentucky the cloth-top stave barrel is generally used.

FIG. 11.—Grabbling potatoes after digging with a turnplow. The pickers separate the tubers from the soil in the upturned furrow and throw them into piles, ready to be picked up and placed in containers.

GRADING AND PACKING.

A large proportion of the crop is graded as gathered by the pickers. In the Hastings district in Florida machine graders or sizers are used to a considerable extent (see fig. 14). The potatoes are picked up in collapsible slat crates, in which they are hauled to the grading machine. Texas growers size most of their crop by the use of a wire-mesh hand riddle, which is supported by a stand so constructed that the grade 1 tubers on the riddle are dumped into a chute which discharges them into a sack (fig. 17).

The double-headed barrel is the ideal package when properly filled and headed. The cloth-top stave barrel comes next, followed by the

slat barrel, the 100-pound sack, the 150-pound sack, and the hamper. The 150-pound and the 180-pound sacks are too heavy for convenient handling. The hamper does not ship well, because it is lacking in rigidity, and when it is shipped in car lots the lower tier of packages is likely to be crushed.

The double-headed stave barrel is suitable only for shipment during reasonably cool weather unless it is well ventilated. Without ventilation the contents are almost certain to overheat in transit.

MARKETING.

Marketing the early potato crop of the Southern States, particularly of sections south of the Virginias, offers a distinctly different problem from that of the disposal of the late crop or the fall crops, because it is much more perishable. As a rule, the potatoes are gathered, graded, packed, and hauled direct from the field within a few hours after they are dug (figs. 18 and 19).

FIG. 12.—A field of potatoes poorly cared for, which has been allowed to become overgrown with grass and weeds. The elevator digger, while successfully lifting the crop, can not free the tubers from the weeds and soil.

In some of the large commercial sections well-organized produce exchanges may be found. The practice of making f. o. b. sales[5] by both the individual growers and the exchanges is becoming general. Shipments on consignment are the exception, not the rule, and are resorted to only when the movement is in excess of the inquiries or demands of the buyers. The banding together of the growers in an organization such as an exchange makes possible a much wider and more intelligent distribution of their crop and at the same time avoids to a large extent the possibility of an oversupply being shipped to certain markets, with a resultant glut and a decline in price.

THE LATE OR MAIN CROP.

The production of late or main-crop potatoes in the South is confined very largely to the northern tier of Southern States and to the more elevated sections of certain of the others; as, for example,

[5] Sales at prices which include the delivery of the potatoes on board the cars at the point of loading.

the mountainous sections of northeastern Georgia and the southwestern and western sections of South Carolina, where the climatic conditions, owing to altitude, very closely approach those of the more northern States. Of the 16 Southern States, 10 are included in this list.

The late or main crop of potatoes as grown in the South corresponds to that which is grown in the North and the far West. It consists of late or medium-late maturing varieties, which are planted rather late in the spring, being intended for fall and winter use.

LATE VARIETIES.

The varieties most commonly grown for the late or main crop are the Green Mountain and Gold Coin of the Green Mountain group (fig. 20), and the Rural New Yorker No. 2, Carman No. 3, and Sir Walter Raleigh of the Rural group (fig. 21). Other varieties grown to some extent are the White Star of the Burbank group and the Early Ohio.

FIG. 13.—A gasoline tractor which is employed in many ways on the farm. In this instance it is being used very successfully to operate the elevator potato digger in a field near Hastings, Fla.

DATE OF PLANTING.

The dates of planting the late or main-crop varieties in the States in which this crop is grown, as presented in detail in Table V, extend from April 1 to June 5.

The dates specified in the table, as previously stated, are approximate rather than actual; but it is believed that the bulk of this crop is planted between the dates specified for each State.

SOIL.

A heavier type of soil may be utilized in growing a late or main crop than the early crop, as earliness is not of such prime importance. Heavy clay soils and poorly drained soils should, of course, be avoided, but northern or northwestern exposures are not objectionable.

PREPARATION OF THE SOIL.

The preparation of the soil does not differ essentially from that required for the early crop except that it is never plowed into ridges or beds; hence, the suggestions previously given regarding fall and

spring plowing and also the preparation of the seed bed apply with equal force to the late or main crop.

FERTILIZERS.

It is not customary to use commercial fertilizers in as large amounts on the late or main crop as on the early crop, nor is the fertilizer used as high in its content of nitrogen. It is slightly higher, however, in phosphoric acid and potash. The usual grade of fertilizer used analyzes 2 per cent of ammonia, 10 per cent of phosphoric acid, and 6 per cent of potash and usually is applied at the rate of 600 to 1,200 pounds per acre. Farm manures have the same relative value and use for the late as for the early crop.

FIG. 14.—Grading, sizing, and barreling the potato crop at Hastings, Fla.

CULTURAL DETAILS.

The treatment of the seed, cutting, planting, tillage, and spraying of the crop are practically the same as for the early crop except that level culture is practiced in some of the potato-growing areas.

HARVESTING.

As a rule, the late crop is not harvested until it is fully mature, because it is grown for fall and winter consumption. The date of digging may vary from the middle of August to the latter part of October, depending upon locality, prevailing prices, and whether it is grown for commercial purposes or for home consumption. In general, the crop is handled and disposed of in much the same manner as the late crop in the Northern States. Strictly speaking, the late crop can be considered as important only in Maryland, West Virginia, and the mountainous sections of Virginia and North Carolina.

THE FALL CROPS.

The fall crops of potatoes may be considered under two rather distinct heads, viz, (1) the fall crop proper, consisting of late-maturing varieties chiefly grown for table stock, and (2) the second crop, consisting of early varieties planted for the especial purpose of growing seed stock for the early crop of the ensuing year.

FIG. 15.—A barrel of potatoes ready to be covered. In the Atlantic seaboard States north of Florida the bulk of the crop is marketed in barrels with burlap covers.

FIG. 16.—A barrel of potatoes with the burlap cover held in place by the upper hoop, which should be securely nailed.

The only true second-crop production in the United States is found in Oklahoma, Arkansas, Texas, and other Southern States where the tubers from the first crop are used in planting the second crop.

PLACE OF THE FALL CROPS IN THE ROTATION.

Except in Delaware and portions of Maryland and Virginia, a considerable part of the fall crop is planted on land from which an early crop of potatoes has just been harvested. The grower tries to avoid preparing a new seed bed by planting in the same drill rows from which the early crop was dug. In this way the fall crops can feed upon any unused fertilizer applied to the first crop.

LATE-MATURING VARIETIES.

The leading late-maturing variety grown as a fall crop is known under several different names. In Maryland, Virginia, and the Carolinas it is generally known as the McCormick or the Peachblow; in Georgia and Tennessee it is usually called Lookout Mountain; while in some other localities it is called the Hoosier. Under the priority rule in nomenclature this variety should be recognized as the McCormick, owing to the fact that it was originated by the Rev. T. B. McCormick, of Princeton, Ind. The name Hoosier comes from its having been produced in Indiana. Ostensibly the only claim it has to the name Lookout Mountain is that the variety succeeds well in that vicinity. The McCormick's popularity is due to the fact that it is unusually resistant to heat and drought. These qualities enable it to pass through a hot and dry period without serious injury and to make a satisfactory crop of tubers during the cool weather of autumn. The McCormick tubers are deep-eyed (fig. 22) and generally of poor table quality.

FIG. 17.—The sizer or grader used by Texas potato growers.

Other varieties less generally and less widely grown are the Jersey Red, White McCormick, White Star, Peerless, and varietal members of the Green Mountain, Rural, and Russet Rural groups.

The Jersey Red has not been definitely identified, but it is thought to belong to the Early Rose group. It is grown as a late-maturing variety in Delaware and possibly to some extent in certain portions of Maryland. It is claimed to be prolific and well adapted to that particular region as well as to certain parts of New Jersey.

The White McCormick is confined very largely, if not entirely, to Maryland and Virginia. In habit of growth, in character of stem, foliage, and flower, and in resistance to heat and drought it is the counterpart of the McCormick. As its name indicates, the tubers of the White McCormick are white skinned. Other variations, such as fewer and shallower eyes and the absence of color around the eyes, represent the outward physical variations of this variety as compared with the McCormick. In table quality it is superior to the McCormick and should supersede this variety wherever it can be grown with equal success. The Russet Rural is a comparatively new variety and so far as known is only grown to a very limited extent in Virginia.

The White Star and the Peerless varieties are grown in southern Louisiana and in some of the adjacent States, where they seem to succeed well.

SECOND-CROP VARIETIES.

The varieties planted for second-crop production of seed intended for planting the early crop of the ensuing late winter or early spring are the Irish Cobbler, Triumph, and others usually grown as early-crop potatoes. They are grown in the same portions of the South as the early crop of the variety.

PRODUCTION CENTERS.

The fall-crop production centers are not so well defined for the late-maturing varieties produced for table purposes as are those in which a second crop of early-maturing varieties is grown for seed purposes.

FIG. 18.—Hauling potatoes to the shipping station in Virginia.

Of the former crop probably the heaviest producing sections are in northern Georgia, certain portions of Tennessee and North Carolina, the Norfolk and Eastern Shore of Virginia districts, and the peninsular section of Delaware and Maryland.

Second-crop production is mainly centered around Fort Gibson, Okla., and the Fort Smith district in Arkansas and Oklahoma; Columbia, Tenn., Louisville, Ky., and the Eastern Shore of Virginia and Maryland. The Triumph is grown in the first three localities, and the Irish Cobbler in the remainder.

DATE OF PLANTING.

The date of planting the late-variety crop and the early-variety crop is approximately the same; hence, one set of dates will serve for both. These dates for the several States, as presented in Table V, show an extreme variation of approximately three and one-half months, or from June 20 in Maryland to October 1 in Florida.

SEED.

The seed used in planting the late-variety crop of potatoes in the case of the McCormick, the White McCormick, and the Jersey Red varieties is locally grown stock from the preceding fall crop. This seed stock is quite largely held over from one year to another in ordinary cellars or vegetable houses. Very often much sprouting occurs, and in general the practice can hardly be regarded as satisfactory. Seed dealers as a rule keep the seed stock in cold storage after the weather becomes warm. This keeps it firm and dormant and in much better condition than in ordinary storage.

Seed of the Green Mountain, Rural, and Russet Rural groups and White Star and Peerless varieties is usually grown in the North and

FIG. 19.—Loading potatoes at St. Matthews, Ky. These potatoes are intended for bulk shipment. The barrel is simply used as a convenient container in which to haul the tubers.

shipped late the next spring to points in the South, where it is placed in cold storage until a week or two before it is to be planted. Then it is taken out and allowed to warm up and start to sprout before it is cut and planted. These varieties do not maintain their normal vigor and productiveness if locally grown seed is used year after year. The southern grower finds it more profitable, therefore, to buy northern-grown seed each year.

In the case of the second crop, it has been found desirable and, in fact, necessary in some sections to use northern-grown seed of the preceding season for the planting of the second crop of the Irish Cobbler variety. On the other hand, it has been found possible and desirable in the Oklahoma and Arkansas second-crop areas to plant seed twice removed from the North. That is, northern-grown seed from Nebraska, Minnesota, or Wisconsin is planted for the early crop;

then seed from the early crop is planted for the second crop. The seed produced from the second crop, which is known locally as "junior seed," is considered superior to northern-grown seed for planting the early crop of the ensuing year. If this operation is continued another year the grower has what is known as "senior seed," which is distinctly inferior to "junior seed" and not quite equal as a rule to good northern-grown seed. Thereafter the seed stock deteriorates so rapidly that usually it is not considered desirable to carry locally grown seed beyond the junior stage.

FIG. 20.—A typical Green Mountain tuber.

HANDLING TRUCK-CROP TUBERS FOR SECOND-CROP SEED.

Where early or truck-crop tubers are used as seed for the second crop, several methods of handling them in the interim between the date of harvesting the tubers of the early crop and using them as seed for the second crop have come into practice. The potato tuber when newly harvested normally requires a certain rest period before it will begin to sprout, and the different methods of handling the seed are a direct result of effort on the part of the grower to shorten this rest period and to obtain as good a stand as possible in the second crop.

The Triumph variety responds more satisfactorily than the Irish Cobbler to the methods employed in second-crop production.

The following six cultural practices have come to the writer's attention, each having its advocates:

Practice No. 1.—The small or unsalable potatoes, really the culls, from the first crop are immediately planted back in the same furrows from which they were harvested or sometimes in some previously

prepared piece of land. This practice has the disadvantage of a slow, imperfect germination, making necessary the subduing of weed growth on the land during the time between planting and the actual appearance of the plants above ground or else allowing the land to become weedy during this interim. Unfortunately, this practice has a good many followers.

Practice No. 2.—This course differs from No. 1 only in that instead of planting the culls immediately where they are to grow, a trench is opened with a plow by throwing out one or two furrows in either direction. The trench thus formed is filled to a depth of 4 to 6 inches with the seed potatoes, and the soil is thrown back

FIG. 21.—A typical tuber of the Rural New Yorker No. 2.

over them. The seed is left in this condition until wanted for planting, generally three to five weeks, when the trench is opened and the potatoes sorted over. Only those which show sprouts are selected for seed purposes, thus insuring quick germination and a good stand of plants. The success of this practice depends very largely upon the selection of a well-drained site on which to trench the seed stock. Serious losses are often incurred through the soil around the tubers being soaked by heavy rains and the potatoes then being exposed to a high temperature. This results in the rapid decay of the tubers unless they are removed and dried.

Practice No. 3.—This differs from the foregoing practices in that the tubers intended for seed are spread out on the ground in some shaded place, as under a house, in a shed, or under a tree, where they

are exposed to light. Under these conditions the skin soon becomes green and tough, and they begin to show signs of germination in from three to five weeks. As in the preceding case, the grower selects those tubers that have begun to germinate.

Practice No. 4.—This practice differs from practice No. 3 in the following respects: The tubers are covered with a layer of straw, coarse hay, or other material which protects them from the light. This covering in some cases is kept more or less moist throughout the period in which they are thus held before planting. The covering and the moisture prevent excessive loss of water by the tubers, and it is claimed that a quicker germination is thereby induced.

Practice No. 5.—So far as known, this practice originated about 1916. It consists in immediately placing the seed potatoes from the first crop in cold storage, where they are kept at a temperature of 32° to 34° F. for three to five weeks, after which they are taken out and allowed to warm up for a week or two before planting. The effect of the low temperature on the new potato is to shorten the rest period and thus hasten germination. It is evident that this method is practicable only in localities where there is a cold-storage plant.

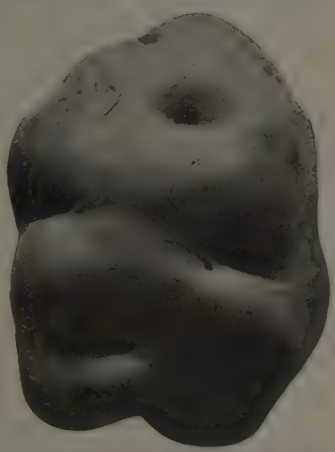

FIG. 22.—Typical tuber of the McCormick variety, an extremely deep-eyed strain, to be avoided.

Practice No. 6.—This practice is, to some extent at least, combined with each of the preceding ones. It consists in clipping off the seed ends or other portions of the skin of small tubers intended for planting whole. By this practice it is claimed that germination is induced earlier and that it is better than when the surface of the tuber is not mutilated. The same result is obtained when cut seed is planted. The actual effect of removal of the skin or of cutting the tuber is to increase the loss of moisture, which seems to result in a greater activity of the life processes of the plant, thereby inducing an earlier germination.

SUGGESTIONS FOR IMPROVEMENT IN PRESENT PRACTICES.

Good seed is just as important for the second crop as for the first one. The present practice of using for second-crop seed the potatoes which are small or for other reasons are unsalable, or, in other words, the planting of potato "runts," is not to be commended. Careful investigations have demonstrated that potatoes below 1 ounce in

weight do not give as large a yield as those weighing from 2 to 4 ounces, even though the latter may be halved or quartered and the former planted whole. When it is remembered that the small, unsalable potatoes from the early crop probably do not average more than an ounce in weight and that a great many are under this weight, especially where the early crop sold at a high price, it can be readily seen that the resultant crop will be much below what it ought to be.

It is fully believed that if seed potatoes ranging from 2 to 4 ounces in weight were used instead of the very small ones, as is now the practice, the resultant yields would be increased from 25 to 50 per cent or more. The 2-ounce tuber could be cut in two, the 3-ounce one could be divided into three pieces, and the 4-ounce tuber quartered, if desired, thus giving a 1-ounce seed piece. Better results from the standpoint of seed production would follow if the 2-ounce tuber were planted whole except for the removal of portions of the skin to hasten germination, and the 3-ounce cut in two.

Practices Nos. 3 and 4 are probably the most practical and the safest from the standpoint of tuber decay if the weather is wet, provided they are combined with practice No. 6 in all cases where germination is not apparent.

Better preparation of the seed bed before planting the second crop will also serve to increase the yield.

DEPTH OF PLANTING.

In general, it is advisable to plant the fall crops considerably deeper than the early crop, on account of high soil temperatures, which are unfavorable to tuber development, and also for the purpose of securing better moisture conditions. On sandy loam soils the seed may be planted from 5 to 6 inches deep, but on the heavier types 4 to 5 inches is more satisfactory.

CULTURE OF THE CROP.

The cultural details involved in the production of a fall crop of potatoes are practically the same as for an early crop. Good tillage is essential to a good crop.

SPRAYING.

In some localities late-blight has been known to cause considerable damage to the crop if the autumn weather is favorable for its development; hence, in these regions the spraying of the plants with Bordeaux mixture should not be neglected. Insect pests are probably no more troublesome on the fall than on the spring crop, but in any event they should not be allowed to cause serious injury to the plants, and the right insecticides should be applied at the proper time.

HARVESTING.

The fall crops do not as a rule reach full maturity before being cut down by frost. This gives, in the case of the second crop, the desired immaturity of seed stock, but it is not so desirable when the potatoes are grown for table use.

The harvesting period of the fall crops extends from the latter part of October in Delaware and Maryland to December and January in Florida and other extreme southern points. Usually the crop on the Eastern Shore of Virginia is harvested early in November, and in the Norfolk district not until the middle of that month.

YIELDS.

The yields from the late-maturing varieties grown for table purposes are extremely variable. In a good growing season yields of 50 to 60 barrels or more per acre are not uncommon, but in less favorable ones 10 to 30 barrels may represent the total crop.

The same relative variation occurs in the second crop, but the yields are rarely as good. They vary from almost nothing in extremely unfavorable years to 40 or 50 barrels in exceptionally good seasons. Generally speaking, the fall crops are more uncertain than the early and the late or main crops because of the greater possibility of unseasonable conditions influencing the yield.

MARKETING THE FALL CROPS.

The fall crops, unlike the early crop, are usually put into storage when dug, to await a more favorable market.

As a rule, the second crop when well grown is considered by many growers rather more desirable for seed purposes than northern-grown seed, even though it does not, as has been previously mentioned, reach market maturity quite so early. Its use in the localities in which it is grown also saves the transportation charges involved in the purchase of northern seed.

STORAGE.

Southern potato storage houses as a rule are inferior to those found in the North. They usually consist of cheap "dugout" structures, partly below ground, in which the crop can be stored in a fairly satisfactory manner during the winter months of December, January, and a portion of February, provided proper attention is given to opening doors, windows, or ventilators on cool nights and closing them in the early morning. Generally speaking, however, these storage houses are insufficiently ventilated and are more or less unsanitary. It is believed that better storage houses for the potato are among the pressing needs of the potato industry in the South. It is econom-

ically unsound from a business standpoint for the potato-consuming public of the South to be dependent upon the North for its table supply of potatoes during a considerable portion of the year. With proper storage facilities it should be possible for the people of the South to make themselves almost entirely independent of the northern crop for table use, thus effecting a vast saving in transportation charges and commissions.

SUMMARY.

The value of the early potato crop in the South, because of its higher selling price, is out of all proportion to the number of bushels.

The wide variation in the percentage of early-crop potatoes grown in the 16 Southern States is closely associated with the position of the States with respect to latitude and the lay of the land with respect to altitude. Latitude and altitude are important determining factors.

The fluctuations in the acreage planted in 1917 as compared with that of 1916 were due to the short late or main crop in 1916.

The potato industry of the South may be divided into three distinct branches or phases of production, viz, (1) the early or truck crop, (2) the late or main crop, and (3) the fall crops.

The early crop is planted as early as the season and soil will permit, with the idea of harvesting it as soon as the tubers have reached a marketable size. The leading early varieties are the Irish Cobbler, Triumph, and Spaulding No. 4.

The late or main crop is very largely grown in the northern tier of Southern States and in the more elevated parts of the more southern of those States. The crop is generally planted about as early as the season will permit and is allowed to mature before it is harvested. The Green Mountain and Rural varieties are grown most extensively for this purpose.

The fall crops of potatoes should be considered under two rather distinct heads, viz, the fall crop proper and the second crop. The fall crop proper consists of late-maturing varieties that are chiefly grown for table use. The second crop consists of early varieties planted late for the purpose of providing seed stock for planting the early crop of the ensuing year.

Crop rotation in the South is of a very varied character, and there does not appear to be any well-defined system in vogue in any commercial potato-producing district.

The chief point of interest in connection with the early varieties grown is that they are comparatively few in number and these few are rather definitely confined to certain areas; for example, Spaulding No. 4 in the Hastings district in Florida.

There is a much wider range in cultural practices in the growing of potatoes in the South than in the North. This is due in part to the production of early, late, and fall crops of potatoes and to the character of the soil and climate.

The crop is harvested by hand, plowed out, or removed with an elevator digger. The last method is gradually superseding the others.

Hand or power-driven graders or sizers are used generally in some sections, while in others the grading is largely, if not wholly, done by the pickers.

The almost universal use of the barrel as a container for the crop of the Atlantic Seaboard States and its nonuse in the South Central and Southwestern States, where the sack is the accepted container, are striking examples of local practices.

WASHINGTON : GOVERNMENT PRINTING OFFICE : 1921

UNITED STATES DEPARTMENT OF AGRICULTURE